# Comment on "Universal Distribution of Interearthquake Times"

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In a *Letter* earlier this year [1] and in a number of preceeding publications [2][3][4], the probability distributions for the "waiting time" between earthquake events have been discussed. In particular it appears that the probability distribution for the number of events with waiting time $w$, when expressed in terms of a suitably scaled variable $(w/w_0)$ with $w_0$ some characteristic time constant, follows a universal function [4]. In this *Comment* we would like to draw attention to the fact that recently published data [5] of the CRESST collaboration on microfractures in sapphire show the same features. Indeed there is a great similarity, if not a remarkable complete identity, of the probability distributions expressed in this manner between the earthquakes and the microfractures.

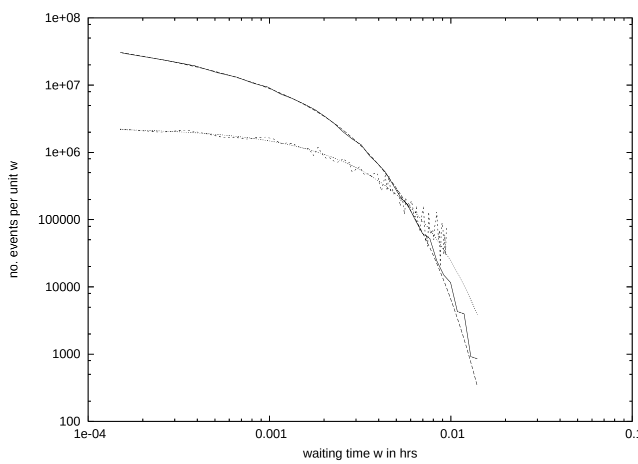


FIG. 1: CRESST waiting time distributions. Upper curve: microfractures, fit to $\propto w^{-\alpha}e^{-w/w_0}$. Lower curve: photon-induced events from a calibration run, fit to $\propto e^{-w/w_0}$.

In Fig 1 we reproduce Fig 2 of ref [5]. The upper curve is the data on microfractures, fit to

$$dN/dw \propto w^{-\alpha}e^{-w/w_0} \qquad (1)$$

with $\alpha = 0.33$ and $w_0 = 0.0014$ hrs. It will be seen there is an excellent fit. The lower curve represents a test of the apparatus and analysis, using photon-induced events from an external radioactive source. These should follow the Poissonian $e^{-w/w_0}$ and there is also a good fit.

According to Corral ( Physica A) the form Eq 1 describes the waiting times for earthquakes, and with the same power, $\alpha = 0.33$. Concerning the time scale parameter $w_0$, it is essentially the inverse of the observational or experimental event rate R since from Eq 1

$$1/R = \bar{w} = (1-\alpha)w_0 \ . \qquad (2)$$

The data used in the Figure satisfy this relation to within a few percent, as would be expected from the good fit. We find that raising the energy threshold in a data set, and so reducing R, leads to a linear relation between the fit $w_0$ and R, as would be expected from Eq 2 with a constant $\alpha$.

Alternatively one could renounce fitting $w_0$, and simply substitute $w_0^{-1} = (1-\alpha)R$ into Eq 1, use the experimental R (=28 000 events/28.5 hrs), and fit for $\alpha$. This essentially one parameter fit is satisfactory and yields $\alpha = 0.26$.

Although the CRESST values for $\alpha$ thus vary somewhat according to the analysis and from run to run, the parallelism between the two kinds of phenomena is striking. These considerations, involving such widely disparate time scales, energies, and material properties, raise the question as to whether Eqs 1 and 2 do not represent a general law, applicable to many kinds of fracture processes.

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